TILES

A Memory Game

Abstract

This program was created for Dr. Leyla Nazhandali to be considered for use in her Microcontroller Programming and Interfacing class. This code is intended to be used on the TI MSP432 Launchpad with Boosterpack.

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Creator’s Note

This program is intentionally very minimalistic. It was done this way so that students could expand upon these requirements to make their versions of this game their own. All HAL files, with the exception of graphics_HAL files, were copied directly from previous projects from Dr. Nazhandali’s class in an effort to ensure that nothing was being included that had not been taught. An effort was also made to ensure that this project would not be too difficult for a student to do as their second or third project in this class.

1. Project Overview

You will be using the TI MSP432 Launchpad and Boosterpack to make a memory game centered around colored tiles. The game will have a startup screen, main menu, and a game over screen. The necessary peripherals are the joystick, S1 and S2 pushbuttons, and LCD display. The game will be coded using a finite state machine.

2. Description

2.1 Main Menu Elements

The main menu will have at least three options: an option to play the game, an option to view previous high scores, and an option to view the directions on how to play the game. The joystick will be used to scroll between the options, and the joystick button will be used to select an option. If the selected option is not the "play game" option, the joystick button will be used to navigate back to the main menu.

2.2 Game Play

After selecting the "play game" (or variant) in the main menu, the game will display a splash screen of a 4x4 grid of tiles for approximately three seconds. The splash screen will then be replaced by an empty or otherwise neutral set of tiles. The player must select a tile using the joystick, then change the color (using S1) to match what they remember from the splash screen. Once satisfied with their tile set, the player can then submit the set (using S2) for checking. The player will get +1 score for each correct tile and -1 score for each incorrect tile. If the player is not out of lives after the check, a new round will start, and a new splash screen will be displayed.

The game screen will display the player's score, the number of lives the player has left, the tile that the player currently has selected (#1-16), and the color of the currently selected tile. The player's score starts at 0 and has a maximum possible value of 999. The player's lives start at 10 and have a minimum possible value of 0.

The game ends when the player runs out of lives. At that point, after the check, instead of starting a new round, a "game over" screen will be displayed, and the player will be able to go back to the main menu.

2.3 Game Over

On the "game over" screen, the player's score will be displayed. If the score is a new high score (1st, 2nd, or 3rd place), flashing text will indicate as such. The player will be able to press the joystick button to navigate back to the main menu.

3. Key Concepts Used

- Graphics
- Timers
- ADC
- FSM
- Debouncing
- Blocking/Nonblocking

4. Possible Bonus Features

4.1 Sound

- In the Golden Solution, there is commented-out code to play a jingle on the "game over" screen (main.c - line 396)
- A "boop" could be played whenever the player moves the joystick or hits a button
- Music could play on the main menu screen

4.2 Difficulty Levels

- Increase the number of colors when difficulty increases
- Increase the number of tiles when difficulty increases

4.3 Pause Menu

- Give the option to go back to the main menu
- Give the option to save the game
    - Would then be able to return to the saved game from the main menu
- Give the option to mute sound

4.4 ImageReformer Images

- In the Golden Solution, an image file created using ImageReformer is used on the "game over" screen (main.c – line 411)
- Use images on the introductory splash screen, the main menu, and/or in game